HEALTHY FATTY ACIDS

Fatty acids are essential for human health; they are required in the body to make important compounds, such as the prostaglandins, leukotrienes and thromboxins, which control many important physiological processes. Fatty acids are present in food as either saturated or unsaturated molecules and, usually, as part of triglycerides. The properties and biological action of the fatty acids differ greatly, depending on what group they belong to.

Saturated fatty acids have been shown to increase the risk of coronary heart disease and the current dietary recommendation is to decrease the level of saturated fat in the diet. This type of fatty acid is mainly found in animal products, like red meat, lard, and dairy products, such as butter.

Monounsaturated fatty acids are among the best types of fat to consume. Oleic acid (ω-9) makes up a large percentage of the fatty acid component of olive oil. Research has shown that populations, like those around the Mediterranean, that consume large amounts of olive oil on a regular basis, have a lower incidence of coronary heart disease.

The most widely studied group of fatty acids in the human diet are the polyunsaturated fatty acids. These contain a number of double bonds and the position of these in the molecule is important. The Greek symbol omega (ω) is used to indicate the position of the first double bond from the methyl carbon. The two main groups of polyunsaturated fatty acids are referred to as either ω-3 or ω-6 fatty acids.

The body is capable of synthesising many of the fatty acids it requires. However, humans cannot insert double bonds in the ω-6 and ω-3 positions. Therefore, the fatty acids, linoleic (ω-6) and α-linolenic (ω-3) are essential fatty acids, and must be obtained from foods. Foods high in ω-6 fatty acids include plants and plant oils. Fish, nut oils and some plant oils, like canola and soybean, contain high amounts of ω-3 fatty acids.

The type and amount of fatty acid in a particular food has a positive or negative effect on that food's nutritional quality. Foods high in saturated fat like animal products are not particularly good for human health and are contributors to coronary heart disease risk. Foods such as nuts are seen to be good for the body, as they contain high levels of mono- and polyunsaturated fatty acids, which are believed to decrease the risk of heart disease. Nuts, like walnuts, are high in the ω-3 fatty acids, which are essential for the body and would seem to be the most effective at reducing the risk of coronary heart disease.

Fat can contribute to obesity and a greater risk of heart disease, but it is important to keep in mind that the right type of fat must be consumed in order for our bodies to function correctly.

While the body requires a supply of ω-3 and ω-6 fatty acids for its efficient function it is important that a balance is maintained between these two groups. Modern diets tend to supply an excess of ω-6 fatty acids and this leads to an overproduction of ω-6 eicosanoids [1] which tend to lead to inflammation, blood clotting and enhanced growth of cancer cells in the body. The same enzymes are used for converting both the ω-3 and ω-6 fatty acids to eicosanoids. So recent research strongly suggest that the amount of ω-3 fatty acids eaten in the diet should be increased (in order to effectively out compete the ω-6 fatty acids for the enzymes involved in eicosanoid synthesis). Increased production of ω-3 eicosanoids will lower the adverse effects of the over production of the ω-6 eicosanoids.

What are the good sources of ω-3 fatty acids? The data presented in Table 1 are the mean values for common New Zealand plant and nut oils. The four oils in the top group appear to meet the current dietary guidelines of an ω-6:ω-3 fatty acid ratio of less than 10. These mean values, however, hide a natural variation in the composition of fatty acids in foods and oils. Many different cultivars of each nut are grown and each one has a slightly different nutrient composition.

Table 1. Mean fatty acid content of some plant and nut oils

% total fatty acids

	16:0	16:1	18:0	18:1	18:2 ω-6	18:3 ω-3	20:1	Ratio ω -6:ω-3
Canola oil	5.0	0.3	1.8	58.2	20.8	10.1	1.3	**2:1**
Wheat germ oil	18.5	-	1.4	15.4	53.6	10.4	-	**5:1**
Walnuts	7.5	0.2	2.1	16.1	60.0	11.4	-	**5:1**
Soybean oil	10.9	0.1	4.1	20.4	54.5	8.4	0.2	**6:1**
Macadamia nuts	9.8	26.7	2.1	48.4	3.4	0.2	2.0	17:1
Olive oil	14.0	1.4	2.8	66.8	11.8	0.6	0.3	20:1
Avocado	12.0	3.5	-	75.1	8.6	0.4	-	22:0
Corn oil	14.0	0.3	2.3	30.0	50.0	1.6	0.2	31:1
Cottonseed oil	23.0	1.3	2.4	21.0	49.0	1.4	-	35:1
Peanuts	10.7	-	2.7	49.0	29.0	0.8	1.1	36:1
Almonds	6.3	0.7	1.7	70.9	19.1	0.5	-	38:1
Hazelnuts	5.2	0.3	1.8	80.7	10.7	0.2	0.1	54:1
Safflower seed oil	9.1	-	2.3	19.9	66.5	1.2	0.3	55:1
Grape seed oil	8.1	0.5	4.0	18.9	64.5	0.4	-	161:1
Sunflower seed oil	7.7	-	3.8	21.9	64.7	0.3	0.2	223:1

Table 2 presents a summary of some data on cultivars of walnuts grown at one location in Canterbury, NZ. The ω-6:ω-3 ratios of the cultivars give a range from 3.9 to 5.7, which is covered up when a mean ratio of all the Canterbury grown nuts are presented (4.5). Clearly Rex is the best cultivar to consume if a low ratio of ω-6:ω-3 is being sought.

It should be noted, however, that many plant and nut oils such as olive and hazelnut oil have a high ratio of ω-6:ω-3, but these also contain high levels of oleic acid (18:1), a monounsaturated fatty acid, which has been shown to have a beneficial lowering effect on blood cholesterol levels.

Table 2. Summary of the highest and lowest 18:3 containing walnuts grown in Canterbury.

% total fatty acids

Cultivar	16:0	18:0	18:1	18:2 ω-6	18:3 ω-3	20:1	Ratio ω-6:ω-3
McKinster (Low 18:3)	6.2	0.1	18.7	61.3	10.7	0.1	5.7:1
Rex (High 18:3)	6.6	0.1	12.7	62.5	16.2	0.1	3.9:1
Mean (13 cultivars)	7.0	0.6	17.5	59.7	13.2	0.1	4.5:1

Walnuts contain a very positive ratio of ratio ω-6:ω-3 when compared to other oils commonly consumed cultivar Rex has the best ratio within all the walnuts currently evaluated.

The regular consumption of walnuts in the diet has been shown have a very positive effect against heart disease. The consumption of Rex would appear to have even greater advantages when compared to the average composition of the other main cultivars of walnuts.

As well as containing a positive ratio of ω-6:ω-3 fatty acids walnuts are nutrient-dense and contain significant amounts of antioxidants such as vitamin E, phytosterols, polyphenols and important minerals such as magnesium, potassium and copper as well as dietary fibre.

Footnote

Eicosanoids

[1] Eicosanoids are signaling molecules derived from ω-3 or ω-6 fatty acids. They exert complex control over many bodily systems, especially in inflammation, immunity and as messengers in the central nervous system. The networks of controls that depend upon eicosanoids are among the most complex in the human body.

The ω-6 eicosanoids are generally pro-inflammatory; ω-3's are much less so. The amounts of these fats in a person's diet will affect the body's eicosanoid-controlled functions, with effects on cardiovascular disease, triglycerides, blood pressure and arthritis. Anti-inflammatory drugs such as aspirin and NSAIDs act by downregulating eicosanoid synthesis.

There are four families of eicosanoids: the prostaglandins, prostacyclins, the thromboxanes and the leukotrienes. For each, there are two or three separate series, derived either from a ω-3 or ω-6 essential fatty acid. The different activities of each series largely explain the health effects of ω-3 and ω-6 fats.

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